NEW PATENT APPLICATION
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APPLICATION FOR UNITED STATES LETTERS PATENT

TO WHOM IT MAY CONCERN:

Be it known that we, Ingram S. Chodorow , a citizen of the United States residing at 14478 Altamar Court, P.O. Box 675167, Rancho Santa Fe, CA 92067 and Zubair Mirza, a citizen of the United States residing at 570 Fairview Avenue, Wyckoff, New Jersey 07481, have invented new and useful improvements in:

AUTOMATIC PRESSURE RELEASE TOOTHBRUSH

of which the following is the specification.

CROSS REFERENCE TO RELATED APPLICATION

This application is based on and claims priority of United States Provisional Patent Application No.: 60/154,418 filed September 17, 1999, entitled AUTOMATIC PRESSURE RELEASE TOOTHBRUSH

BACKGROUND

1. Field of the Invention

This invention is in the field of toothbrushes, particularly typical toothbrushes where the user applies oscillating, linear, circular and other motions along with varying amounts of axial pressure of the bristles on the tooth and gum surfaces.

2. Background of the Invention

It is well accepted that regular brushing of the teeth along with flossing, dental examinations, and other appropriate care is essential to maintain healthy teeth and gums or to at least to minimize deterioration. In this regard hundreds of millions of toothbrushes are used regularly throughout the world.

A variety of new toothbrush designs have been periodically introduced into the oral care market with new features that improve performance or ergonomics. Some of the many new designs included different angles of the head and/or the bristles, different tuft designs, varying hardness and stiffness of the bristles, and even wear markers either on the handle or in the bristles to indicate fatigued bristles and to signal the time to replace the toothbrush. Also, in recent years mechanized toothbrushes have been introduced which move bristles in various circular or transverse motion patterns, and also axially at extremely high speeds.

Many of these toothbrushes represented significant advances. However, one particular issue or problem persists and has led to proposed solutions which run the gamut of extremes. This is the issue of how stiff and/or hard the bristles should be to adequately clean the teeth without damaging the enamel surface of the teeth.

About twenty-five years ago hard or stiff bristles were preferred, because soft and medium bristles were considered too weak to achieve adequate cleaning. Makers of brushes with natural bristles proclaimed their products safer and superior to nylon and other plastic bristles. More recently, soft bristles have been generally considered by dentists as the only safe bristles to use to avoid both enamel and gum damage.

The debate remains unresolved as to which of the above toothbrushes is best; however, a vast number of people continue to suffer from worn enamel and/or bleeding or sore gums because of the toothbrushes or brushing techniques they use. Thus, none of these dental developments has adequately solved the above discussed problems of damaged enamel and gums caused by the toothbrushes or brushing techniques.

SUMMARY OF THE INVENTION

The present invention (a) recognizes the failure of the oral care industry to develop a toothbrush with ideal bristles that are best or safest with regard to enamel and/or gum damage, and (b) proposes a totally different approach that solves the problem and is applicable with all or most existing toothbrushes.

The issue the present invention addresses is excessive pressure applied to the teeth and gum surfaces during brushing. All of the attempted solutions with different bristle materials, tuft patterns, varying stiffness and handle ergonomics fail to deal with the fundamental fact that users of toothbrushes apply by their own hands uncountable variations in pressure of the bristles onto their own teeth. Not only does each person exert a different force, each person will vary his or her force depending on the angle of the hand holding the brush as different areas of the mouth are brushed. So, a medium bristle may be applied very hard in some areas, or a hard or medium bristle may be pressed inadequately to properly clean. There is no way to effectively teach people exactly how hard to press the tuft or bristles against the teeth and gums, and

because of varying angles of toothbrushes and arm and finger positioning any attempted pressure level could not be maintained constant anyway.

The new toothbrush invention includes a hinge between the handle and the head with its bristles. When light to moderate pressure is applied it performs like all other toothbrushes. When the pressure of the bristles on the teeth is excessive according to a predetermined safe level of pressure, the hinge automatically releases the head causing it to bend backward, in a direction away from the teeth.

The hinge has a preset pressure threshold. In typical toothbrush use a person holds the handle and through the handle and the head at the end thereof, applies pressure of the bristles onto the teeth. It is basic mechanics that the pressure applied by the bristles is experienced by the head of the toothbrush and by the hinge to which the head is coupled. When this pressure reaches the predetermined unsafe threshold level, the hinge gives way, and in a preferred embodiment snaps to a new position whereby the head is in an awkward and unusable position, and the user is forced to stop brushing and stop applying the excessive pressure. This alteration of the toothbrush structure remains until the user manually corrects it by snapping or otherwise pushing the head back into its original position.

This elegant and simple solution automatically prevents excessive force from being applied to the teeth and gum surfaces, and more importantly, teaches the user what excessive pressure feels like so that an excessive level of force can be avoided and a correct level learned and maintained. The new hinge can take a variety of forms, the preferred one at present being a bi-stable spring having two positions where the spring is integrally molded with the toothbrush handle and head. This hinge is a type of toggle mechanism whereby the head is biased to go to and remain in either a first position (normal position) or in a second position which is intended to be so awkward that it is essentially un-usable. The transition from first to second position occurs when the user presses the bristles too hard against the teeth. This force is transmitted to the head and thence to the hinge which automatically reverses its configuration and drives

the head to said second position. In a variation the hinge would merely release the head from being held in said first position and leave it floppy or loosely attached to the handle. The toothbrush remains essentially unusable until the user manually returns the head back to said first position. This return automatically activates the hinge spring to its first condition wherein it biases the head to stay in said first position until the force on the head again becomes excessive causing the head to snap to said second position.

One preferred embodiment of the hinge uses a rectangular elongated strip of resilient plastic compressed in the longitudinal direction until it bows and functions as a bi-stable spring; another preferred embodiment uses an elongated spoon-like or concave spring of resilient plastic; a third preferred embodiment uses a two-part hinge with a bi-stable biasing spring between these parts.

In all of these configurations the spring will, when excessively stressed, snap to an inverted stressed configuration. Application of such excessive force by the user to the bristles and thence to the toothbrush head will bend the head which is firmly connected to said top end of the hinge that snaps to its second position. Subsequently, the head is either manually forced back to its first, normal position, or it can be designed to return automatically after a predetermined time period.

Preferred embodiments of this invention will be described below with reference to the appended drawings.

<u>BRIEF DESCRIPTION OF THE DRAWINGS</u>

Fig. 1 is a right side elevation view partially in section of a first embodiment of the new invention,

Fig. 2 is a rear elevation view thereof,

Fig. 3 is a front elevation view thereof,

Fig. 4 is a fragmentary sectional view taken along line 3-3 in Fig. 2,

Sub A1 Fig. 4A is a side elevation similar to Fig. 4 but shows the hinge activated and the toothbrush head moved to its second position,

Fig. 5 is a schematic side elevation view similar to Fig. 1 but of a second embodiment,

Fig. 6 is a rear elevation view of Fig 6,

Fig. 7 is a front elevation view of Fig. 6,

Fig. 8 is a fragmentary side view taken along line 9-9 in Fig. 8,

Fig. 9 is a fragmentary front and right side perspective view of the toothbrush of Figs. 6 and 8,

Fig. 10 is a front elevation view of Fig. 10,

Fig. 11 is a cutaway right side elevation view of a fourth embodiment of the new toothbrush with a multiple component hinge,

Fig. 11A is an exploded perspective view of the hinge of Fig. 11,

Fig. 11B is a fragmentary section taken through Fig. 11, and

Fig. 12 is a fragmentary side elevation view of a fifth embodiment showing it in two positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The first embodiment 10 of the new toothbrush is seen in Figs. 1-3, 4 and 4a-4i consisting of a handle 11, head 12 with bristles 13 and a hinge 14 connecting the head and handle. Figs. 2-4 show further details of the hinge 14 comprising a central strip 15 having top and bottom ends 15T and 15B respectively and intermediate arch or bow 15C.

Fig. 3 shows the hinge as essentially three parallel strips, namely central spring strip 15 and adjacent outer strips 16. Figs. 4 and 4a show further details of hinge 14 where the arch or bow spring element 15 is connected by its tip part 15T to the head 12 and by its bottom part 15B to the handle 11. This arch has a bowed configuration because it is in axial compression while the adjacent elements 16 are in tension. The bow is a bi-stable spring which attains a first stable condition or position shown in Fig. 4 with the longitudinal axis 12A of the head angled slightly to the left of the

longitudinal axis 11A of the handle, and a second stable condition 18 shown in dotted lines in Fig. 4a with the spring element 15 from the right side position in Fig. 4 to the left side position in dotted lines in Fig. 4A, and with the head inclined to the right. This results from a force applied in the rightward direction to the head as indicated by arrow 19.

Most toothbrushes have the head either coaxial with the handle or angled forward as seen in Figs. 1 and 4; the rearward angle of the head per longitudinal axis 4R in Fig. 4a results in a toothbrush with an awkward configuration which is essentially unusable until the head is returned to its normal position.

Figs. 4b and 4c show the toothbrush and spring in a succession of positions where the spring bows from right to the left. Fig. 4d shows the spring alone bowed to the left; Figs. 4b and 4c show the left side tension element 16. Figs. 4e-4g show further details of the spring element through its transition from right to left bowing and the corresponding angular change of the head 12 from left to right. Figs. 4h-4i show the cross-sections of Figs. 4e and 4g respectively whereby the spring's concavity is reversed.

Figs. 5 - 10 illustrate a second preferred embodiment which differs from the first embodiment primarily in the configuration of the hinge and spring element. Similar structural elements of the handle, head and bristles will have the same reference numeral designations and new structure will have new reference numbers. In this second embodiment 40 the handle 11 and head 12 are essentially the same as before. The hinge 41 is an elongated concave or spoon shaped elastic element 43 seen most clearly in Fig. 9. Fig. 8 shows how the center area 43c of the dish is thinner than the top and bottom ends 43T, 43B respectively. This dish has a thickness of about 0.020 inches on the side edges, about 0.030 inches at the center of the dish, and 0.050 inches at the top and bottom ends where the spring element is thicker where it joins the head and handle respectively. As with the firsts embodiment, excess pressure on the head is translated to the top end 43T of the concave spoon-shaped spring which eventually

snaps to inverted convex shape, thus directing the head to its new angled position.

This second embodiment has the advantage of simplicity of structure and economy of manufacture, in addition to operating simply and effectively. As with the earlier-disclosed embodiment, the entire toothbrush handle, hinge and head can be molded in a single cavity mold in a single molding stage. Obviously, these toothbrushes will be manufactured in typical high-speed multi-cavity injecting molding machines, with the bristles incorporated into the toothbrush head in a standard manner.

The third embodiment 50 follows the same principles of operation of the prior embodiments, but utilizes a multi-component hinge as seen in Figs. 11, 11A, 11B and 12. In this structure the handle 61 defines at its top end a hinge yoke 62 having side walls 63 and a central pivot axis 64. The head 65 has the same pivot axis 64 and a pivot axle not shown through said axis 64.

At the bottom end 65B of the head is a detent or spring biased ball 66 (see Fig. 11A) that extends outward and engages recesses or holes 67a, 67b in the yoke. When ball 66 is in recess 67a the head is inclined to the left in its position for normal operation. When the bristles are pressed excessively hard on the teeth or gum, force is applied in the direction of arrow 68 (Fig. 11) which pivots the head clockwise about the handle within yoke 62 until ball 66 engages recess 67b. In this configuration the toothbrush would be unusable, and thus the teeth enamel would be protected from further excessive abrasion.

In this embodiment the detent is designed to release the head to pivot only when the force per arrow 68 is sufficient to overcome a pre-set threshold resistance limit of the detent. If the pre-set threshold is set at 6 ounces, then any force greater than 6 ounces will cause pivoting of the head. A variation of the embodiment of Fig. 11 will have a detent 66 as shown but only one recess 67a. When the detent is in recess 67a the head will be in the initial and proper orientation relative to the handle. When the head is forced out of this position and the detent is driven out of recess 67a, the head will be free to "flop" backward. In one version there will be a stop to limit the

backward movement of the head. In either case the head will pivot but not snap to an unusable orientation until it is manually pushed back to its initial position. In these embodiments the head either remains in its initial position until the threshold force is exceeded, or the head flexes proportionately to the applied force but does not release until the threshold is reached.

Fig. 12, parts (a) and (b) shows a variation where there is the same yoke 62 and tongue 65B as in Figs. 11 and 11A and the same pivot axis 64; however, instead of spring action by the ball detent in Figs. 11 and 11A, there is a flexible flat spring 69 which flips or snaps from being concave facing left (part a) to being concave facing right (part b) when the toothbrush head 65 pivots per arrow 70 similarly as the spring in the first embodiment disclosed herein.

All of these embodiments and other variations within the scope of this invention apply the principle of altering the position or orientation of the toothbrush head when excessive force is being applied by the bristles to the teeth or to the gums.

Although the present invention has been described in relation to particular embodiments thereof, many other variations and modifications and other uses will become apparent to those skilled in the art. It is preferred, therefore, that the present invention be limited not by the specific disclosure herein, but only by the appended claims.